

# Water Pressure

## Introduction

The pressure lesson will allow the student to examine and predict what water pressure can do to certain types of material at different depths.

## Objectives

By the end of this lesson, the student will be able to do the following:

- Summarize how much air pressure is felt at sea level.
- Define atmospheres (ATMs) and millibars (mbs).
- Calculate water pressure at any given depth in ATMs.
- Determine the effects water pressure has on various types of material at any given depth.
- Discuss ways of overcoming the effects of water pressure while exploring the ocean floor.

## Pressure

### 1. Air Pressure

- a) Pressure is a push or force against a surface.
- b) At sea level, air pressure presses down on the human body at 14.7 pounds per square inch (psi).
- c) The body does not feel the effect because fluids in the body pushing outward nullify the effect of the air pressure pressing down.

### 2. Water pressure

- a) As you go deeper in the ocean, a noticeable change occurs.
- b) Think about when you swim to the deep end of a pool and you feel an increase of pressure on your eardrums.
- c) The reason for this feeling is due to an increase in hydrostatic pressure.
- d) Hydrostatic pressure is the force per unit area exerted by a liquid on an object. (Pressure=Force/Area)
- e) In the U.S., pressure is measured in pounds per square inch (PSI).
- f) As you descend into the ocean, the pressure increases at a rate of 1 atmosphere (atm) for every 33 feet.

### 3. Experiments

#### a) Plunger experiment

Equipment: 2 plungers

1. Take two plungers and squeeze them together forcing all the air out.
2. Explain the principal of 14.7 PSI
3. Have two volunteers pull on both ends of the plungers to try to get them apart. Don't let them pull so hard that they will fall down if the plungers part.
4. Take the plungers back from the volunteers and ask how we can part the plungers. Explain that we have to let air back in.

b) Water column experiments.

Equipment: 4 foot water column acrylic cylinder  
6 foot rubber tubing,  $\frac{1}{2}$ " diameter  
Straws  
Air Stone from aquarium filter

1. Take the water column and fill with water to 6" from the top.
2. Attach the air stone to one end of the rubber tubing.
3. Submerge the air stone to just below the surface of the water.
4. Place a straw on the other end of the rubber tubing.
5. Pick a volunteer and have them blow through the straw and blow bubbles.
6. Have volunteer stop blowing and submerge air stone half way down the water column.
7. Have volunteer blow into straw again to make bubbles and ask them if it was harder or easier. It should be harder.
8. Have volunteer stop blowing and submerge air stone all the way down the water column.
9. Have volunteer blow into straw and make bubbles. It should be very hard to get bubbles. Explain water pressure.

c) Vacuum Pump experiment

Equipment: Vacuum pump  
Bell Jar  
Marshmallows

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d) Pressure Chamber experiment

Equipment: Scuba tank and regulator  
Balloons  
Styrofoam cups

e) Shape of containers at great depths-spheres  
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